CHIRONOMID HEMOGLOBIN PROTEIN AS A MOLECULAR BIOMARKER FOR SPECIES IDENTIFICATION AND GENETIC DIVERSITY USING WILD LARVAE FROM KEARNY MARSH, N.J.

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Chironomids, aquatic larvae of midge fly (Diperta: Chironomidae), are abundant, widely distributed, sediment-dwelling organisms that should be used more often for field studies. One major challenge to their use is distinguishing between species based on morphological characteristics. In this study, hemoglobin protein detected by SDS-PAGE gel was evaluated for its ability to discriminate between species collected at Kearny Marsh, an oligohaline wetland that is part of the New Jersey Meadowlands. Hemoglobin protein is highly polymorphic in chironomids and important for their ability to survive in organic, suboxic wetland sediments. Genetic diversity of hemoglobin protein was also evaluated by comparing larvae collected from different sites in the marsh. In one study (May to August 2004), one site had higher concentrations of heavy metals than the other. In a second study (May to November 2006), the sediments were either capped or uncapped with AquaBlok, an aggregate clay-based technology. Proteins were separated by SDS-PAGE based on weight (kilodaltons). Hemoglobin profiles from individual larvae were distinguished by the presence or absence of bands as well as band intensities. Band profiles were compared to larval head capsules, which are commonly used to identify species. Results showed unique hemoglobin profiles that corresponded with three different species. One species was identified as *Glyptotendipes lobiferus* (five profiles) and another as *Endochironomus nigricans* (two profiles). The third species appeared to be a *Glyptotendipes lobiferus*/*Chironomus riparius* hybrid (three profiles). In the first study, *G. lobiferus* was more abundant and had more polymorphic hemoglobin profiles than the other species found, *E. nigricans*. Hierarchical clustal analyses of data found that hemoglobin diversity could not discriminate between levels of sediment metal contamination using either species. During the second study only *G.lobiferus* and the hybrid were found. The abundance of hybrid individuals increased over time particularly at uncapped sites. There was little hemoglobin diversity in *G. lobiferus* regardless of season or capping treatment. Hemoglobin diversity in the hybrid was more variable in summer than fall and more variable in uncapped than capped sites. Water quality measurements suggested that dissolved oxygen might have influenced hybrid abundance and hemoglobin diversity. Findings of this study indicated that hemoglobin protein polymorphisms can assist with species identification of chironomids and may serve as a biomarker of changing ecological conditions.